

California Hantavirus Surveillance Report 1999

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California Hantavirus Surveillance Annual Report 1999

Hantavirus pulmonary syndrome (HPS) was first recognized in 1993 when an outbreak of acute illness of unknown etiology occurred among residents of the Four Corners area in the southwestern United States. The illness was characterized by a prodrome of fever and flu-like symptoms that rapidly progressed to respiratory distress and was frequently fatal. The etiologic agent was identified as a previously unrecognized member of the hantavirus genus: Sin Nombre virus (SNV). Rodents, particularly deer mice (*Peromyscus maniculatus*), were identified as the principal reservoir of the virus, which they shed in urine and feces.

Since 1993, the California Department of Health Services (DHS), in cooperation with local health agencies, vector control programs, academic researchers, and others, has conducted surveillance for hantavirus in human and non-human mammals in California. This report summarizes results of this surveillance during 1999.

Hantavirus Pulmonary Syndrome in California Residents

Six cases of HPS were identified in California residents during 1999. In addition, one case of non-pulmonary acute hantavirus infection was identified in a California resident.

Kern County, March 1999. A 33-year-old male presented to a local emergency clinic with approximately six days of diarrhea, fever, chills, and night sweats, and three days of headache and photophobia. Following hospitalization, the patient experienced respiratory distress and was transferred to intensive care for intubation and mechanical ventilation. Bilateral infiltrates were noted on thoracic radiographs. The patient subsequently recovered and was discharged.

Serum tested positive for immunoglobulin M (IgM) and immunoglobulin G (IgG) to SNV by DHS, Viral and Rickettsial Diseases Laboratory (VRDL), the Special Pathogens Branch of the Centers for Disease Control and Prevention (CDC), and a private laboratory in Utah.

The patient worked for an oil company and owned a 10-meter trailer permanently located at his work site, approximately 35 miles northwest of Taft, which he used as a temporary residence. The patient reported an on-going mouse problem in the trailer and reported contact with dead rodents, excreta, and nest material. The patient cleaned out the trailer approximately one month prior to onset of illness and noted stirring up considerable dust and rodent droppings inside the trailer at the time.

Investigation of the trailer by staff from DHS Vector-Borne Disease Section (VBDS), Kern County Environmental Health, and Kern County Department of Public Health identified an expansive rodent population in the area, with deer mice regularly observed outside the trailer at midday. A gnawed hole where the main external power cord entered may have provided rodent ingress to the trailer. Rodent carcasses and excreta were prevalent inside the trailer. Twenty *P. maniculatus* were collected over 32 trap-nights in and around the trailer. Sera from eight (40%) deer mice had detectable antibody to SNV.

Kern County, April 1999. A 23-year-old male was seen at an urgent care center with a two-day history of fever, vomiting, and diarrhea. The following day, the patient was hospitalized with difficulty breathing, non-productive cough, and light-headedness. Coarse inspiratory crackles were noted throughout both lung fields. Thoracic radiographs showed diffuse pulmonary alveolar infiltrates in all lung fields. The patient was intubated and provided supplemental oxygen, but died on the afternoon of admission. VRDL and CDC detected IgM antibody to SNV in serum collected at admission.

The patient's family reported that a few days before onset the patient and his wife moved and cleaned boxes in their garage and had noted significant amounts of rodent droppings. The patient had no known direct contact with live or dead rodents or other opportunities for exposure at home, at work, or recreationally.

Investigation by Kern County Environmental Health and VBDS revealed some, but not abundant, signs of rodents in the patient's garage. Rodents were not evident in the patient's home or vehicle. Rodent excrement and a deer mouse

carcass were noted in an old, seldom used car on the property. Sixty trap-nights around the patient's residence yielded only one *P. maniculatus*. However, numerous carcasses and abandoned nests were observed in water meter boxes in an orchard that surrounded the patient's residence. Poisoned rodent bait was reported to have been placed in these meter boxes several months earlier, but the patient had no known contact with the meter boxes. A second *P. maniculatus* was collected from one of these meter boxes. Testing of rodent sera at VRDL detected SNV antibody in the deer mouse collected at the patient's residence.

Inyo County, June 1999. A 17-year-old female died approximately two hours after presenting to a local emergency clinic in severe respiratory distress. The patient had experienced fever, myalgia, abdominal pain, and diarrhea for approximately two weeks that progressed to respiratory involvement 2-3 days prior to her death. Antemortem serum tested positive for IgM and IgG antibody to SNV by VRDL and TriCore Reference Laboratories (University of New Mexico [UNM]). CDC reported this same specimen positive for IgG to SNV.

The patient's parents reported that they had experienced extensive mouse problems in their home and had conducted a regular program of placing snap traps throughout. The patient frequently handled dead rodents, often without gloves or other protection. The patient had limited opportunity for exposure outside the home and had no history of travel during the weeks preceding her illness.

The Inyo County Department of Environmental Health and VBDS conducted an on-site evaluation of the patient's residence. The patient lived in a mobile home in a rural high-desert (approximate 5000 ft. elevation) area of northern Inyo County.

Inspection of the property surrounding the home identified several woodpiles, discarded furniture, and abandoned vehicles that likely served as rodent harborage. Live rodents were observed among some of the woodpiles and vegetation. Although no mice were observed within the residence, rodent feces were discovered in cupboards in several rooms. Traps set in and immediately around the residence yielded only *Dipodomys* sp. Fifty traps set approximately 100 meters from the residence yielded one *P. maniculatus*; another 50 traps set along an irrigation canal, approximately 400 meters from the residence, yielded an additional seven *P. maniculatus*. One deer mouse collected along the irrigation canal tested serologically positive for SNV antibody.

Inyo County, June 1999. A 66-year-old white female presented to an emergency clinic with five days of fever, chills, generalized body aches, nausea, and shortness of breath. Thoracic radiographs were unremarkable and the patient was discharged on clarithromycin. The following day the patient was hospitalized with severe headache, vomiting, and fever. Thoracic radiographs remained unremarkable. By the third day of hospitalization, the patient had developed respiratory compromise that necessitated transfer to a hospital in Los Angeles County. Following transfer, thoracic radiographs revealed some pleural effusion of the right lung and atelectasis of the left lung. The patient was provided supplemental oxygen but did not require intubation or mechanical ventilation. The patient recovered and was discharged one week later. A private laboratory reported positive IgG serology for Hantaan and Puumala viruses. The laboratory later tested against SNV and reported positive IgG antibody. IgM and IgG seropositivity to SNV were confirmed by VRDL.

The patient lived on five acres of undeveloped

land in southwestern Inyo County. She reported having previously observed but not handled rodents (squirrels, chipmunks, kangaroo rats) and their excreta in and around her home. However, extensive rodent-proofing measures, including regular inspections, in the months preceding her illness, led to her having seen no rodents during this period. She reported no history of travel outside Inyo County during the two months preceding her illness.

Staff of the Inyo County Environmental Health and VBDS conducted an environmental assessment and rodent surveillance at the patient's residence. The residence was located at approximately 3500 ft. elevation in high desert habitat. Minimal evidence of rodents or rodent harborage was observed in or around the residence. Native, uncultivated vegetation extended outward from approximately 40 feet from the residence. Rodent surveillance was conducted in and around the patient's residence (119 trap-nights) and three local sites she had visited to fish. A total of eight rodents (4 *P. maniculatus*, 3 *Mus musculus*, 1 *Neotoma lepida*) were collected at the patient's residence, and 41 rodents (1 *Microtus* sp., 10 *N. lepida*, 1 *Peromyscus* sp., 6 *P. crinitus*, 23 *P. maniculatus*) from the three riparian sites. Two *Peromyscus* sp. from one of the riparian sites were seroreactive to SNV.

Mono County, July 1999. A 47-year-old female was hospitalized in northern Inyo County with a one-day history of fever, chills, myalgia, and shortness of breath. Thoracic radiographs at admission showed interstitial infiltrates consistent with noncardiogenic pulmonary edema. The patient's pulmonary status continued to decline following admission, necessitating increased efforts to maintain oxygenation. Intubation and mechanical ventilation were initiated on July 22, however her oxygen saturation did not significantly improve. The patient was transferred to a

university medical center in Sacramento. However, following transfer, the patient responded well to respiratory support and vasopressors, improved, and was discharged from the hospital two weeks later. Elevated serum IgM and IgG antibody to SNV was detected by VRDL and UNM. CDC reported detecting IgM but not IgG antibody in this specimen.

The patient reported having a cat that frequently captured and deposited in her home chipmunks, squirrels, gophers, and mice. The patient stated that she usually disposed of these rodents with a dust pan, but specifically recalled having handled a dead mouse one week prior to illness. Ten days prior to illness, the patient worked to clear an irrigation ditch (approximately 4500 ft. elevation) where she reported having noted rodent droppings in a steel feed-and-tack shed in which were stored the tools she used. The patient was employed as a registered nurse in northern Inyo County and had minimal opportunity for occupational exposure to rodents. She had no significant history of travel in the two months preceding her illness.

Staff of Inyo County Environmental Health, Mono County Health Department, DHS Veterinary Public Health Section, and VBDS conducted a site evaluation and rodent surveillance at the patient's residence and the irrigation ditch. Rodent feces were observed in storage and cabinet areas throughout the residence. Rodent feces were also observed outside in association with lumber and firewood piles. Eight *P. maniculatus* (2 inside, 6 outside) were collected from the patient's residence. Serum specimens from four (50%) deer mice were positive to SNV. A single *Reithrodontomys megalotis* was collected at the irrigation ditch.

Contra Costa County, April 1999. A 27-year-old female presented to her private physician with five days of fever, myalgia, progressive dyspnea, and

severe unilateral flank pain. Pyelonephritis was diagnosed and the patient was treated with ceftriaxone. The patient was hospitalized the following day with worsening flank pain, chills, nausea, and emesis. Thoracic radiographs showed diffuse interstitial infiltrates; plain and contrast studies of the patient's abdomen were unremarkable. On the second day of hospitalization, the patient was transferred to intensive care for intubation and mechanical ventilation because of worsening dyspnea and persistent tachycardia. Follow-up thoracic radiographs revealed diffuse bilateral "white-out" consistent with adult respiratory distress syndrome. The patient died the evening of the second day of hospitalization.

Because of the uncertain cause of the patient's death, her case was enrolled in the Unexplained Deaths Project (UNEX), an on-going collaborative study between CDC and several state health departments, including California. CDC pathologists reviewed and tested tissues and serum for multiple agents that cause respiratory illness, following a standard UNEX protocol. In December 1999, IgM antibody to SNV was detected by VRDL in a post-mortem serum specimen. UNM and CDC subsequently confirmed IgM and IgG reactivity in an ante-mortem serum specimen. CDC reported detecting immunohistochemical evidence of hantavirus infection in kidney tissue.

Interviews with the patient's family failed to implicate any specific opportunities for likely rodent exposure. The patient engaged in no domestic or recreational activities that would have placed her at risk of contact with rodents. Her travel history consisted only of trips to urban areas during the 3-4 months prior to onset. The patient reportedly moved some boxes in a rental storage facility in late January, but her husband reported noting no signs of rodents at that time.

Staff of the Contra Costa Mosquito and Vector Control District and VBDS conducted an evaluation and rodent surveillance of the patient's residence, work site, and the storage unit. No signs of recent rodent activity were evident at the residence, although a few old droppings were noted. Similarly, a few rodents droppings, some fairly recent, were noted at the storage unit. However, rodent trapping efforts at both locations were unsuccessful. Staff of the Alameda County Vector Control District and VBDS visited the patient's work site to evaluate the potential for rodent exposure. The patient worked at a national research facility in Alameda County as clerical support staff. Her work station was on the ground floor of a high security two-story building that housed approximately 150 employees. She rarely visited other buildings on the facility except to make deliveries or visit the cafeteria. Building maintenance staff reported that there had been ongoing concern about rodents in some buildings, but snap-traps had yielded fewer than a dozen captures in the preceding 12 months. Evaluation of the patient's former work station revealed a few rodent droppings in a desk drawer. Similar evidence of rodents was observed in cupboards and drawers elsewhere in that and neighboring buildings. However, 200 trap-nights at the facility yielded only a single *Mus musculus* from the neighboring building.

Acute SNV infection without pulmonary syndrome.

Inyo County, September 1999. A 50-year-old male presented to a local hospital with a seven-day history of muscle cramps, headache, and sweats and approximately 3-4 days of sore throat and vomiting. Physical exam revealed mildly elevated temperature (101.3°F), an erythematous pharynx, and coarse breath sounds on thoracic auscultation. The patient was treated

with two doses of ceftriaxone (1g IM each) and released. The patient returned the following day complaining of significant pain in his legs and lower back. The patient was transported to a hospital in Kern County for work-up of suspected encephalitis/meningitis. Upon admission the patient was noted to be moderately thrombocytopenic with a mild fever (101.7°F). Thoracic radiographs and cerebral imaging studies were unremarkable. Two days after admission, the patient was clinically much improved and was discharged. IgM and IgG seroreactivity to SNV was detected by VRDL, UNM, and CDC.

The patient lived in a double-wide mobile home. He reported having observed no evidence of rodent activity around this residence for nearly a year prior to his illness. The patient worked as a heavy equipment operator for the California Department of Transportation. He reported also conducting maintenance and repair of equipment and facilities as part of his job and recalled noting rodent droppings in several buildings in which he had swept. The patient occasionally resided in a trailer located near his work site in Shoshone. In early August he had cleared vegetation and debris from around this trailer. He also reported having collected firewood in the Inyo National Forest in mid-August and camping in Tuolumne, Napa, and Monterey Counties in early September.

The Inyo County Department of Health, Department of Environmental Health, and VBDS conducted environmental assessments and rodent surveillance at the patient's residences. There was minimal evidence of rodent activity at the patient's principal residence in Independence. Five *P. maniculatus* and four *P. truei* were collected from the mobile home and surrounding outbuildings. Sera from all nine rodents tested negative for SNV antibody at VRDL. At the patient's work site trailer, three *N. lepida*, 17 *P. boylii*, and one *P. maniculatus* were

collected; all were negative for SNV antibody. One seronegative *N. lepida* and two *Peromyscus* sp. carcasses were collected from a maintenance yard where the patient worked. Two *P. maniculatus* were collected from the sites where the patient had collected firewood in Inyo National Forest; one was seropositive for SNV.

Since 1993, 25 California residents have been diagnosed with HPS (Table 1). Four of these were identified retrospectively, with onset of illness having occurred in 1980, 1984, and 1992 (2). Twelve cases had a fatal outcome. An additional two California residents have been diagnosed with acute SNV infection without pulmonary syndrome. The mean age of all 27 case-patients was 40 years (range 17 to 68) and 13 were female. Case-patients were residents of 12 counties--Alameda, Contra Costa (2), Inyo (5), Kern (4), Modoc, Mono (7), Nevada (2), Plumas, Santa Barbara, San Bernardino, San Francisco, and Santa Clara. Probable sites of exposure included the counties

of Alameda, Fresno, Inyo (5), Kern (4), Modoc, Mono (7), Nevada (2), Placer, Plumas, and Santa Barbara, and the states of New Mexico (2) and Washington.

Nationwide, a total of 33 HPS cases were identified in 1999. Since 1993, 247 HPS cases have been confirmed in residents of 30 states; of these, 39 cases were identified retrospectively with onset of illness prior to May 1993. California, Arizona, New Mexico, and Colorado account for over 45 percent of all U.S. HPS cases. One hundred fifty (61%) case-patients were male; 189 (77%) were white, 49 American Indian, five African-American, and one Asian; 24 were of Hispanic ethnicity. The mean age of case-patients was 37 years (range 10 to 75). Ninety-eight (40%) HPS cases had a fatal outcome; the case-fatality in HPS cases occurring since 1993 is 33 percent.

Hantavirus Surveillance in California Rodents

Surveillance for hantavirus in rodents was conducted in 16 California counties during 1999. At least one seroreactive rodent was detected in 12 counties; one of these counties (Napa) recorded for the first time rodents seroreactive to SNV. A total of 1644 rodents were trapped and serologically tested, representing 20 species from ten genera (Table 2). Of 1187 *Peromyscus* spp. collected, 62 (5.2%) had serologic evidence of infection with SNV. Active surveillance since 1993 and retrospective analysis of rodent specimens captured since 1975 have identified serologic evidence of SNV infection in 554 (8.3%) of

6656 *Peromyscus* spp. tested. At least one seroreactive *Peromyscus* specimen has been identified in 43 of 51 counties sampled (Table 3). *Reithrodontomys megalotis* and *Microtus californicus* specimens have demonstrated evidence of infection with Sin Nombre-like hantaviruses (El Moro Canyon and Isla Vista, respectively), but these strain variations have not been shown to be pathogenic to humans. Seroreactivity has been occasionally identified in *Neotoma*, *Perognathus*, and *Spermophilus* rodents in California and elsewhere; however, it is believed that these species are incidentally infected with SNV and are not competent reservoirs or vectors. There is no serologic evidence to date of SNV infection in lagomorphs, domestic rodent species, or wild and domestic carnivores.

The DHS acknowledges the contribution of the following agencies to the California hantavirus surveillance program in 1999:

Centers for Disease Control and Prevention, TriCore Laboratories, California State Polytechnic University–Pomona, Inyo County Environmental Health, Kern County Department of Public Health, Kern County Environmental Health, Mono County Health Department, Mono County Environmental Health, Los Angeles County Department of Health Services, Marin-Sonoma Mosquito and Vector Control District, Napa County Mosquito Abatement District, Northwest Mosquito and Vector Control District, Pomona College, Riverside County Environmental Health, San Bernardino County Vector Control Program, San Diego County Health and Human Services, San Mateo County Mosquito Abatement District, Santa Barbara Coastal Vector Control District, Santa Clara County Vector Control District, University of California–Davis, West Valley Mosquito and Vector Control District, Alameda County Vector Control Services District, Contra Costa County Health Services Department, and Contra Costa County Mosquito and Vector Control District.

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Table 1. California Hantavirus Pulmonary Syndrome cases, 1980-1999

Prepared by the California Department of Health Services

Case No.	Onset date	County of residence	Age	Sex	Outcome	Likely exposure locale	Exposure circumstances
1	Feb 1980	San Francisco	22	M	Died	New Mexico	Peridomestic
2	Feb 1984	Inyo	34	F	Died	Deep Springs, Inyo	Peridomestic
3	Sep 1992	Santa Barbara	29	M	Died	Solvang, Santa Barbara	Occupational
4	Aug 1992	Alameda	49	F	Died	WA State or Mono County	Recreational
5	Jul 1993	Mono	27	F	Died	Mammoth Lakes, Mono	Peridomestic
6	Mar 1994	San Bernardino	42	F	Surv	New Mexico	Peridomestic
7	May 1994	Kern	42	M	Died	Mojave, Kern	Occupational
8	Sep 1994	Mono	56	M	Surv	Lee Vining, Mono	Occupational
9	Feb 1995	Mono	42	F	Surv	Walker, Mono	Peridomestic
10	Mar 1995	Nevada	47	M	Surv	Truckee, Nevada	Occupational
11	Jun 1995	Mono	45	M	Died	Crowley Lake, Mono	Peridomestic
12	Aug 1995	Contra Costa	55	M	Died	Cisco Grove, Placer	Recreational
13	Sep 1995	Plumas	32	F	Surv	Graeagle, Plumas	Peridomestic
14	Jul 1996	Modoc	49	M	Surv	Alturas, Modoc	Peridomestic
15	Jul 1997	Nevada	43	M	Surv	Truckee, Nevada	Recreational
16	Oct 1997	Inyo	38	M	Surv	Bishop, Inyo	Occupational
non-P 1	Jul 1998	Mono	37	F	Surv	Mono	Peridomestic

Case No.	Onset date	County of residence	Age	Sex	Outcome	Likely exposure locale	Exposure circumstances
17	Aug 1998	Mono	55	F	Surv	Mono	Occupational
18	Aug 1998	Santa Clara	19	F	Surv	Hume Lake, Fresno	Occupational
19	Nov 1998	Kern	68	M	Died	Inyokern, Kern	Peridomestic
20	March 1999	Kern	33	M	Surv	Taft, Kern	Occupational
21	April 1999	Kern	23	M	Died	Shafter, Kern	Peridomestic
22	June 1999	Inyo	17	F	Died	Bishop, Inyo	Peridomestic
23	June 1999	Inyo	66	F	Surv	Olancho, Inyo	unknown
24	July 1999	Mono	47	F	Surv	Swall Meadows, Mono	Peridomestic
non-P 2	Sep 1999	Inyo	50	M	Surv	Independence, Inyo	Recreational?
25	April 1999	Contra Costa	27	F	Died	Contra Costa or Alameda	unknown

Non-P # = Acute Sin Nombre virus infection without pulmonary syndrome

Table 2. Serologic evidence of hantavirus in rodents collected in California, 1975-1999.

		1999		1975-99	
Species	Common name	No. collected	No. reactive	No. collected	No. reactive
FAMILY SIGMODONTIDAE (New World mice and rats)					
<i>Neotoma fuscipes</i>	dusky-footed woodrat	79	2 (2.5%)	474	4 (0.8%)
<i>Neotoma lepida</i>	desert woodrat	51	0	220	4 (1.8%)
<i>Neotoma</i> sp.	<i>Neotoma</i> (other and non-speciated)	12	0	747	10 (1.3%)
<i>Onychomys torridus</i>	southern grasshopper mouse	0		1	0
<i>Peromyscus boylii</i>	brush mouse	176	5 (2.8%)	499	10 (2.0%)
<i>Peromyscus californicus</i>	parasitic mouse	128	6 (4.7%)	574	19 (3.3%)
<i>Peromyscus crinitus</i>	canyon mouse	21	0	65	3 (4.6%)
<i>Peromyscus eremicus</i>	cactus mouse	65	0	295	7 (2.4%)
<i>Peromyscus maniculatus</i>	deer mouse	664	38 (5.7%)	4607	485 (10.5%)
<i>Peromyscus truei</i>	piñon mouse	96	3 (3.1%)	518	18 (3.5%)
<i>Peromyscus</i> sp.	<i>Peromyscus</i> (other and non-speciated)	37	10 (27%)	99	12 (12.1%)
<i>Reithrodontomys megalotis</i> ¹	western harvest mouse	106	11 (10.4%)	318	41 (12.9%)
<i>Sigmodon hispidus</i>	hispid cotton rat	0		14	0
FAMILY ARVICOLIDAE (voles)					
<i>Clethrionomys californicus</i>	California red-backed vole	0		1	0
<i>Microtus californicus</i> ²	California vole	73	13 (17.8%)	119	20 (16.8%)
<i>Microtus</i> spp.	<i>Microtus</i> (other and non-speciated)	8	1 (12.5%)	16	1 (6.2%)
FAMILY HETEROMYIDAE					
<i>Chaetodipus</i> spp.	pocket mice	16	0	42	0
<i>Dipodomys</i> spp.	kangaroo rat	22	0	66	1 (1.5%)
<i>Perognathus parvus</i>	Great Basin pocket mouse	35	1 (2.9%)	117	2 (1.7%)
FAMILY SCIURIDAE (squirrels and chipmunks)					
<i>Ammospermophilus leucurus</i>	white-tailed antelope squirrel	0		4	0
<i>Glaucomys sabrinus</i>	northern flying squirrel	0		1	0

Species	Common name	1999		1975-99	
		No. collected	No. reactive	No. collected	No. reactive
<i>Sciurus griseus</i>	western gray squirrel	0		1	0
<i>Spermophilus</i> spp.	ground squirrels	0		1226	1 (0.1%)
<i>Tamias</i> spp.	chipmunks	3	0	284	0
<i>Tamiasciurus douglasii</i>	Douglas' squirrel	0		8	0
FAMILY MURIDAE (Old World mice and rats)					
<i>Mus musculus</i>	house mouse	46	0	169	0
<i>Rattus</i> spp.	Norway rat & black rat	1	0	147	0

¹ El Moro Canyon virus² Isla Vista virus

Table 3. Serologic evidence of hantavirus in *Peromyscus* spp. collected in California, 1975-1999.³

County	1999		1975-1999	
	No. collected	No. reactive	No. collected	No. reactive
Alameda	55	2 (3.6%)	77	5 (6.5%)
Alpine			55	11 (20.0%)
Butte			145	15 (10.3%)
Calaveras			46	9 (19.6%)
Contra Costa			36	0
Del Norte			54	1 (1.9%)
El Dorado			51	6 (11.8%)
Fresno			454	59 (13.0%)
Glenn			8	0
Humboldt			61	5 (8.2%)
Imperial			18	3 (16.7%)
Inyo	87	3 (3.4%)	124	6 (4.8%)
Kern	70	9 (12.9%)	161	18 (11.2%)
Lake			49	4 (8.2%)
Lassen			32	3 (9.4%)
Los Angeles	149	2 (1.3%)	495	17 (3.4%)
Madera			66	8 (12.1%)
Marin	13	0	105	3 (2.9%)
Mendocino			19	0
Merced			78	8 (10.3%)
Modoc			77	11 (14.3%)
Mono	10	5 (50%)	234	46 (19.7%)
Monterey			137	6 (4.4%)
Mariposa			58	7 (12.1%)
Napa	24	0	24	0
Nevada			139	52 (37.4%)
Orange			268	10 (3.7%)
Placer			29	2 (6.9%)
Plumas			67	14 (20.9%)

Table 3. continued

County	1999		1975-1999	
	No. collected	No. reactive	No. collected	No. reactive
Riverside	326	24 (7.4%)	763	32 (4.2%)
Sacramento			36	0
San Bernardino	186	7 (3.8%)	430	10 (2.3%)
San Diego	123	5 (4.1%)	593	21 (3.5%)
San Francisco			30	0
San Joaquin			11	1 (9.1%)
San Luis Obispo	8	0	106	6 (5.7%)
San Mateo	100	4 (4.0%)	211	8 (3.8%)
Santa Barbara	6	0	358	89 (24.9%)
Santa Clara	13	1 (7.7%)	141	2 (1.4%)
Shasta			37	4 (10.8%)
Sierra			48	9 (18.8%)
Siskiyou			122	13 (10.7%)
Solano			3	0
Sonoma			220	3 (1.4%)
Stanislaus			15	0
Tehama			35	5 (14.3%)
Trinity			24	8 (33.3%)
Tulare			20	2 (10.0%)
Tuolumne			32	1 (3.1%)
Ventura			237	11 (4.6%)
Yolo	17	0	17	0
Total	1187	62 (5.2%)	6671	554 (8.3%)

³ These data represent records currently entered in DHS statewide rodent hantavirus database and do not necessarily include results of all hantavirus surveillance conducted by local departments, academic researchers, other agencies independently of DHS. Counties for which DHS has yet to document results of rodent hantavirus surveillance are not listed.